



User Manual

EE371

Compact Dew Point Sensor

YOUR PARTNER IN SENSOR TECHNOLOGY



ELEKTRONIK®
Ges.m.b.H.

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EMC note USA (FCC):

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

EMC note Canada (ICES-003):

CAN ICES-3 (A) / NMB-3 (A)

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1 General

This user manual serves for ensuring proper handling and optimal functioning of the device. The user manual shall be read before commissioning the equipment and it shall be provided to all staff involved in transport, installation, operation, maintenance and repair. The user manual may not be used for the purposes of competition without the written consent of E+E Elektronik® and may not be forwarded to third parties. Copies may be made for internal purposes. All information, technical data and diagrams included in these instructions are based on the information available at the time of writing.



Please find this document and further product information on our website at www.epluse.com/ee371.

Disclaimer of Liability

The manufacturer or his authorized agent can be only be held liable in case of willful or gross negligence. In any case, the scope of liability is limited to the corresponding amount of the order issued to the manufacturer. The manufacturer assumes no liability for damages incurred due to failure to comply with the applicable regulations, operating instructions or the specified operating conditions. Consequential damages are excluded from any liability.

1.1 Explanation of Symbols



This symbol indicates safety information.

It is essential that all safety information is strictly observed. Failure to comply with this information can lead to personal injuries or damage to property. E+E Elektronik® assumes no liability if this happens.



This symbol indicates instructions.

The instructions shall be observed in order to achieve optimal performance of the device.

1.2 Safety Instructions

1.2.1 General Safety Instructions

- Avoid any unnecessary mechanical stress and inappropriate use.
- When replacing the filter cap make sure not to touch the sensing elements.
- The device must be operated with the filter cap on at all times.
- For sensor cleaning and filter cap replacement please see the “Cleaning Instructions” at www.epluse.com.
- Installation, electrical connection, maintenance and commissioning shall be performed by qualified personnel only.
- Use the EE371 only as intended and observe all technical specifications.
- Do not use EE371 in explosive atmosphere or for measurement of aggressive gases.
- Do not apply the nominal voltage to the data lines.

1.2.2 Intended Use

The EE371 is intended for the dew point temperature (Td) measurement of compressed air and other non-corrosive and non-flammable gases at pressures. The sensor can be installed in a pressurized system up to 20 bar (290 psi) and 100 bar (1 450 psi), respectively.

The use of the EE371 in any other way than described in this manual bears a safety risk for people and the entire measurement installation and is therefore not allowed.

The manufacturer cannot be hold responsible for damages as a result of incorrect handling, installation, and maintenance of the equipment.

In order to avoid damage to the instrument or health hazards, the measuring equipment must never be manipulated with tools that are not specifically described in this manual.

The sensor may only be utilized in accordance with the conditions defined in the technical data. Otherwise, inaccuracies of the measurement will occur and equipment failures cannot be ruled out.

The steps recommended by the manufacturer for installation, inspections and maintenance work must be observed and carried out for the safety of the user and for the functionality of the equipment.

Unauthorized product modification lead to loss of all warranty claims. This may be accomplished only with an explicit permission of E+E Elektronik!

The device is constructed for operation with class III  power supply (class 2 power supply in USA and Canada).

1.2.3 Mounting, Start-up and Operation

The EE371 dew point sensor has been designed and produced under state of the art manufacturing conditions, has been thoroughly tested and has left the factory after fulfilling all safety criteria. The manufacturer has taken all actions to assure safe operation. The user has to make sure that the equipment is positioned and installed in such a way that safe operation is not impaired. The user is responsible for observing all applicable safety guidelines, local and international, with respect to safe installation and operation on the device.

This manual contains information and notes of caution, which have to be followed by the user to ensure safe operation.

- Mounting, electrical installation, putting into operation and maintenance may be performed by qualified personnel only. Such staff must be authorized by the operator of the facility to carry out the mentioned activities.
- The qualified staff must have read and understood this manual and must follow the instructions contained within.
- All process and electrical connections shall be thoroughly checked by authorized staff before putting the device into operation.
- Do not put damaged products into operation and protect them from accidental commissioning. Mark the damaged product as defective.
- A faulty device may only be investigated and possibly repaired by qualified, trained and authorized staff. If the fault cannot be fixed, the device shall be removed from the process.
- Service operations other than described in this user manual may only be performed by the manufacturer.

1.3 Environmental Aspects



Products from E+E Elektronik® are developed and manufactured observing of all relevant requirements with respect to environment protection. Please observe local regulations for the device disposal.



For disposal, the individual components of the device must be separated according to local recycling regulations. The electronics shall be disposed of correctly as electronics waste.

2 Scope of Supply

- EE371 – Compact Dew Point Sensor
- Inspection certificate according to DIN EN 10204-3.1
- Quick guide

3 Product Description

3.1 General

The compact EE371 Dew Point Sensor with a measuring range down to -60 °C Td and a robust stainless steel housing is ideal for OEM applications in compressed air systems, plastic dryers and industrial drying processes. The core of the EE371 is the monolithic measurement cell type HMC200, manufactured in thin-film technology. Due to the excellent long term stability and durability against condensation the EE371 has low maintenance needs.

An integrated auto-calibration procedure permits a measurement accuracy of <2 °C Td. The recommended calibration interval is 2 years.

The measured values for dew point, frost point or volume concentration are available on two analogue outputs with 4 - 20 mA or 0 - 10 V.

3.2 Auto-Calibration

Dew point temperatures ranging from -60 to -20 °C (-76...-4 °F) at room temperatures correspond to relative humidities of 0.08 to 5.37 % RH.

To guarantee the accuracy at the lowest humidity, even the smallest drift effects in the humidity sensing element must be compensated.

A special auto-calibration method is used to compensate the usual drift effects, which leads to high-precision measurements even at the lowest dew point temperatures.

Auto-calibration is carried out every 30 minutes and takes approx. 3 minutes.

When putting the device into operation after a long interruption, the regular auto-calibration procedure might require a long time to bring the device within specs. Therefore, an advanced auto-calibration mechanism takes place 5 min after power on. This advanced auto-calibration mechanism takes a little bit longer than the regular auto-calibration and is performed up to 5 times during the first hour of operation.

During auto-calibration, the analogue output switches to the state

- Frozen output signal, keeping the last measured value (default behaviour).

3.3 Measuring Range and Accuracy

The EE371 has an accuracy of ± 2 °C specified within the measuring range -60...60 °C dew point.

Measuring signal limitation:

at medium temperature ≤ 20 °C (≤ 68 °F): Td limitation = -80 °C (-112 °F)

at medium temperature > 20 °C (> 68 °F): Td limitation = medium temperature - 100 °C (-148 °F)

e.g. at medium temperature 40 °C (104 °F) the measuring signal is limited at -60 °C (-76 °F) dew point.

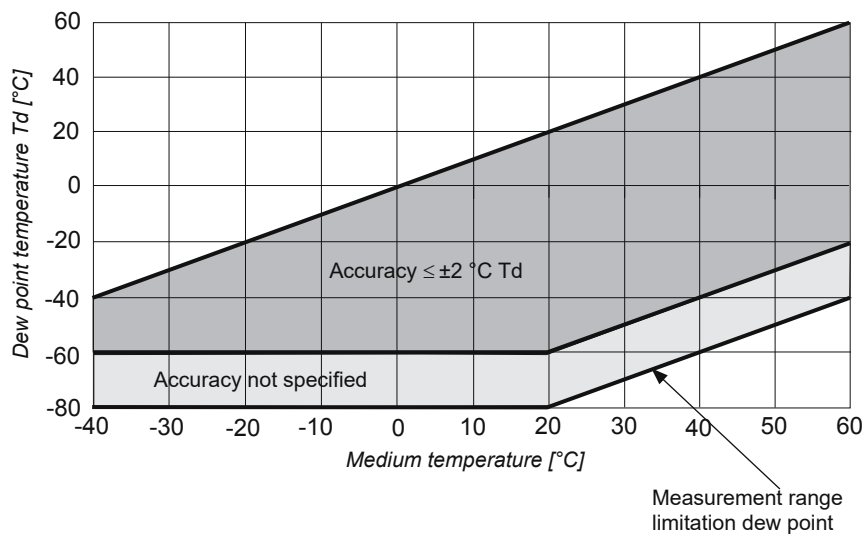


Fig. 1 Dew point measurement range and specified accuracy

The maximum scaling of the analogue output is -100...80 °C (-148...176 °F) dew point.

3.4 Dimensions

Values in mm (inch)

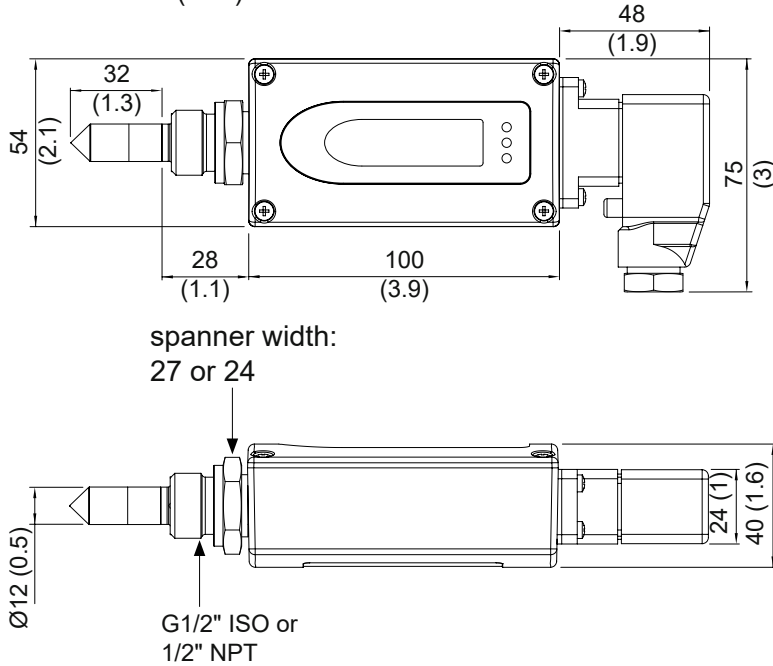


Fig. 2 EE371 dimensions

4 Installation

4.1 Installation Location

Select a location that offers optimum measuring conditions. Air must be able to circulate freely around the sensing element.

Temperature differences between the process and the location of installation do not affect the dew point measurement. However, attention should be paid to the fact that changes in the pressure of a gas also changes the dew point. If there is a pressure difference between the location of installation and the process, the measurement can be several tens of degrees dew point off.

The exact effects of changes in pressure on the dew point can be simulated using the E+E humidity calculator. Please find further details on our website www.epluse.com.

Leakage should be avoided, as ingress of moisture from the environment will interfere with the measurement.



Upon delivery the sensor is protected by a cap that keeps the dew point sensor dry. The cap should only be removed right before installation into the application.

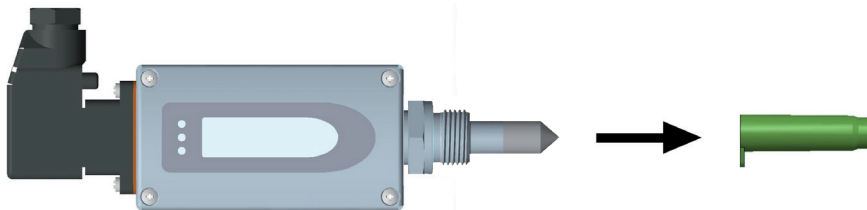


Fig. 3 Remove protection cap

4.2 Installing Directly into the Process

For direct installation in the pipeline, a shut-off valve should be installed on both sides of the process. The sensor can therefore be easily removed for maintenance and calibration work.



It is not permitted to use a sealing ring with a NPT 1/2" thread. Appropriate PTFE sealing tape or sealant should be used instead.

Insert the sensor into the process and tighten it by hand as far as possible. If available, check the sealing ring for correct centring. Tighten the screw connection to a defined torque of 30 Nm.

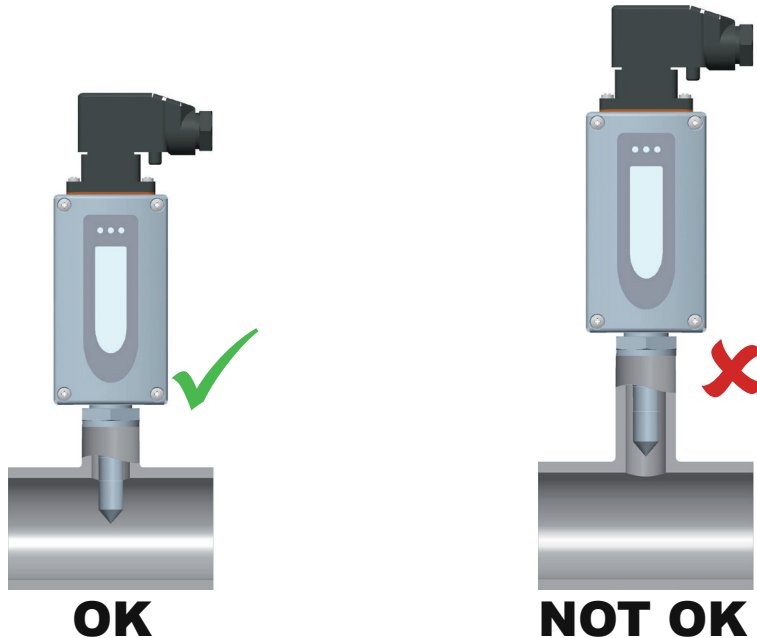


Fig. 4 Direct mounting into the pipe

4.3 Mounting with a Sampling Cell

Sampling is necessary if a direct installation of the sensor in the process is not possible or not required. Reasons may be:

- Process temperature is too high
- Sensor shall be protected against contamination.
- Removing the sensor must not interrupt the process.



To obtain a representative sample of the process gas and to avoid measuring errors, please note the following:

- Differences in pressure between the process and the sampling chamber will result in significant measuring errors.
- Measurements at low dew point temperatures are sensitive to humidity diffusing from the environment due to leaks. Therefore, the sampling system must be pressure-tight.
- Non hygroscopic materials must be used.
- The sampling line should be as short as possible.
- The response time increases if the gas flow is < 1 l/min (0.25 gpm).
- A too low gas flow can result in back-diffusion of humidity from the environment and distort the measurement.

The pipe material does have a significant influence on the response time and the lowest reachable dew point temperature. Fig. 5 illustrates how different tubing materials give off moisture over time when flushed with very dry gas after being at ambient humidity.

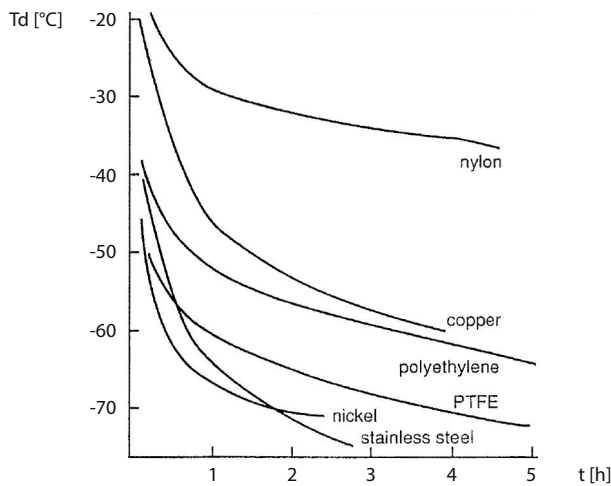


Fig. 5 Moisture given off by different tubing materials (© National Physical Laboratory)

There are several sampling cells available optionally:

- Basic sampling cell
- Sampling cell with quick connector and bleed screw
- Sampling cell for atmospheric dew point

Please refer to the EE371 datasheet and to chapter 9 (Accessories) of this document.

4.3.1 Basic Sampling Cell

Pressure range: 0...64 bar (0...928 psi)

Order code: HA050103 (ISO) HA050105 (NPT)

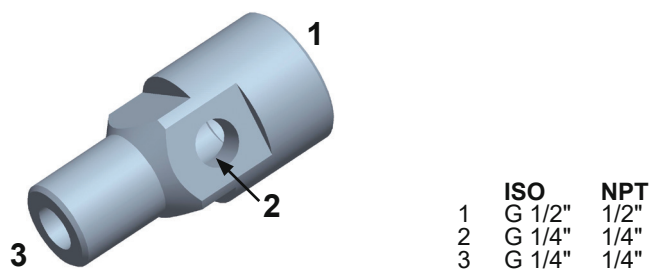


Fig. 6 Basic sampling cell

4.3.2 Sampling Cell with Quick Connector

The sampling cell features a quick-connector suitable for standard compressed air connections DN7.2. It allows the cell to be installed and removed without process interruption.

The air (gas) flow along the sensing head of EE371 can be adjusted using the bleed screw.

Pressure range: 0...10 bar (0...145 psi)

Order code: HA050102

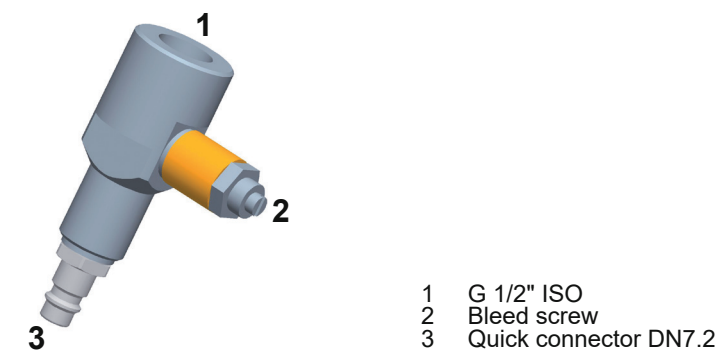


Fig. 7 Sampling cell with quick connector

5 Electrical Connection

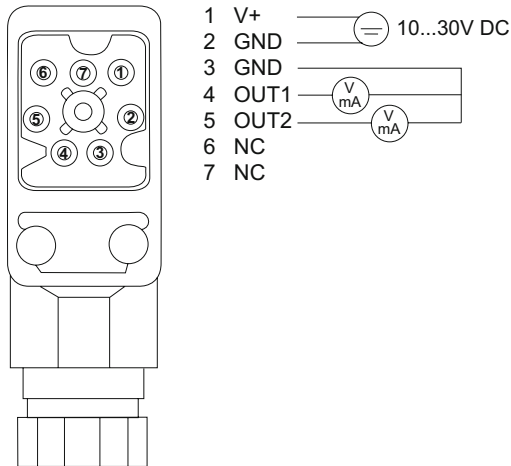


Important note:

The manufacturer cannot be held responsible for personal injuries or damage to property as a result of incorrect handling, installation, wiring, power supply and maintenance of the device.

The electrical connection is made via the 7-pin connector DIN VDE 0627 / IEC 61984. A mating connector is included in scope of supply.

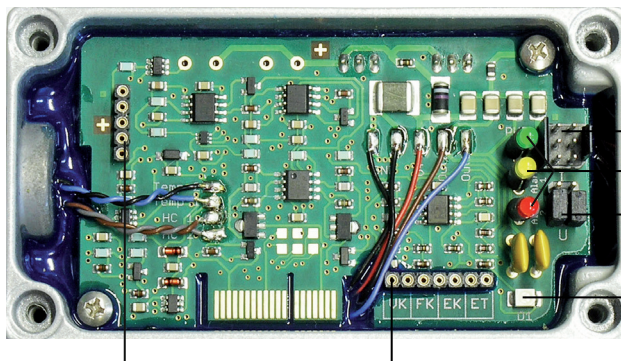
Analogue output



The switching thresholds are factory set:

6 Operating Components

6.1 Electronics Board



1. Serial interface
2. Status LEDs
3. Current-/ voltage output
4. Diagnostic LED
5. Display

1. Serial interface:

Connector for serial interface cable HA010304 or EE-PCA Product Configuration Adapter with HA011063. See data sheets EE371, Accessories and EE-PCA at www.epluse.com/ee371.

2. Status LEDs:

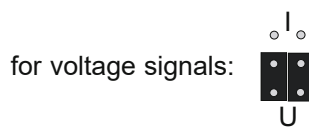
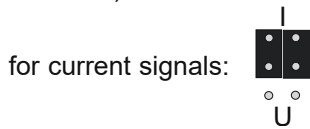
Provide information on the status of the EE371.



Green (Power LED): flashing = EE371 is correctly powered
The yellow and red LEDs don't have any function.

3. Current-/ voltage output:

Jumpers for selecting the analogue output signal. The change from voltage to current or vice versa shall be performed both via hardware (jumpers) and software (with the EE-PCS Product Configuration Software).



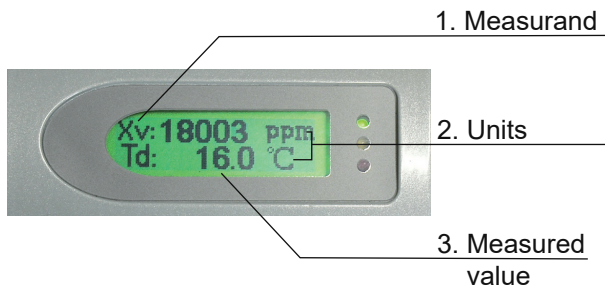
4. Diagnostic LED:

Error indication. See chapter 8.3 (Self-Diagnosis and Error Messages).

5. Display:

Connectors for the optional display module.

6.2 Display Module (Option)



1. Measurand:

		2. Units:	
		SI	US
Td	dew point temperature	°C	°F
Tf	frost point temperature	°C	°F
Wv	volume concentration	ppm	ppm

3. Measured value:

	EE371
Td	-60...60 °C Td (-112...140 °F Td)
Tf	-60...0 °C Tf *) (-112...32 °F Tf)
Wv	20...200 000 ppm

*) over 0 °C dew point will be displayed

7 Setup and Adjustment

The EE371 probe is ready to use and does not require any configuration by the user. The EE371 factory setup corresponds to the type number ordered. Please refer to the data sheet at www.epluse.com/ee371.

With the help of the free EE-PCS Product Configuration Software and the optional RS232 interface cable (order code HA010304) or with the EE-PCA Product Configuration Adapter and the according connection cable (order code HA011063), the user can carry out sensor adjustment and calibration and change the scaling of the analogue outputs.

7.1 EE-PCS Product Configuration Software

To use the software for changing the digital communication settings and to perform adjustments, please proceed as follows:

1. Download the EE-PCS Product Configuration Software from www.epluse.com/configurator and install it on the PC.
2. Connect the EE371 to the PC using the Modbus configuration cable.
3. Start the EE-PCS software.
4. Follow the instructions on the EE-PCS opening page for scanning the ports and identifying the connected device.
5. Click on the desired setup or adjustment mode from the main EE-PCS menu on the left and follow the online instructions of the EE-PCS

7.2 Calibration and Adjustment

Calibration

The calibration documents the accuracy of a measurement device. The device under test (specimen) is compared with the reference and the deviations are documented in a calibration certificate. During the calibration, the specimen is not changed or improved in any way.

Adjustment

The adjustment improves the measurement accuracy of a device. The specimen is compared with the reference and brought in line with it. An adjustment can be followed by a calibration which documents the accuracy of the adjusted specimen.

The dew point temperature adjustment of EE371 can be performed with the free EE-PCS Product Configuration Software, free download at www.epluse.com/configurator.

7.3 Dew Point Adjustment by the User

Dew point adjustment by the user is possible only at low dew points. The adjustment can only be carried out if the difference between the ambient temperature and the reference dew point temperature is $< -60\text{ }^{\circ}\text{C}$.

Example:

Ambient temperature = $20\text{ }^{\circ}\text{C}$

Reference dew point temperature must be lower than $-40\text{ }^{\circ}\text{C}$.

8 Maintenance

8.1 Cleaning the Sensing Element



Caution:

- Never touch the sensing elements.
- Any attempt to clean the sensing elements mechanically such as rubbing or brushing leads certainly to their irreversible damage.

Please refer to the "Cleaning Instructions", available online at the E+E Download-Center.

8.2 Filter Replacement

A contaminated filter cap should be replaced by a new one. The order number for a new filter is HA010103. When replacing the filter, please note the following:

- Unscrew the filter cap very carefully to avoid damaging the sensing element.
- Handling the filter might clog the pores. Use gloves to screw on the new filter.

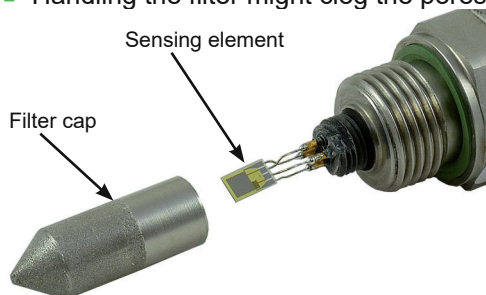


Fig. 8 EE371 filter and sensing element

8.3 Self-Diagnosis and Error Messages

Self-diagnosis via LED on the circuit board:

Power LED (green):

- flashing → EE371 is correctly powered / the microprocessor is active
- constantly lit → Electronics defect => please contact the producer

LED D1 (blue):

- flashing → The sensing element is wet (condensation)
- constantly lit → The sensing element is damaged

Self-diagnostic via display (option):

- Error 1 → The dew point sensing element is damaged
- Error 2 → The sensing element is wet (condensation)
- Error 3 → The temperature sensing element is damaged
- Error 4 → Short circuit on the temperature sensing element

9 Accessories

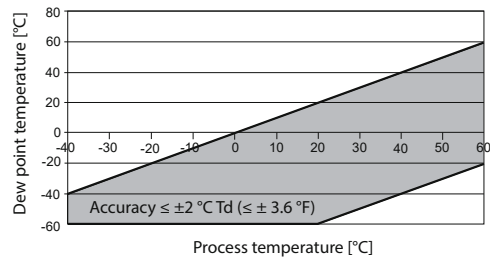
Description	Order code
EE-PCS Product Configuration Adapter	EE-PCA
Connection cable for connecting the EE371 with EE-PCA	HA011063
RS232 interface cable for connecting the EE371 with EE-PCS	HA010304
Sampling cell G 1/2" with quick connector	HA050102
Sampling cell NPT with bleed screw	HA050107
Sampling cell G 1/2" for atmospheric dew point	HA050106
Basic sampling cell G 1/2"	HA050103
Basic sampling cell NPT	HA050105

10 Technical Data

Measurands

Dew point (Td)

Measuring range -60...60 °C Td (-76...140 °F Td)
 Accuracy¹⁾



Response time t_{90} 80 s -20 °C Td → -40 °C Td (-4 °F Td → -40 °F Td)
 10 s -40 °C Td → -20 °C Td (-40 °F Td → -4 °F Td)

Volume concentration

Measuring range 20...200 000 ppm
 Accuracy at 20 °C (68 °F) and 1013 mbar (14.7 psi) ±(5 ppm + 9 % from measured value)

Outputs

Two freely selectable and scaleable analogue outputs for Td, Tf, Wv 0 - 10 V 0 mA < I_L < 1 mA
 4 - 20 mA, 3-wire R_L < 500 Ohm R_L = load resistance

General

Power supply class III \diamond ²⁾ 15 - 30 V DC
 Current consumption, typ. voltage output 40 mA / during auto-calibration: 100 mA
 at 24 V DC current output 80 mA / during auto-calibration: 140 mA
 Pressure range 0...20 bar (0...290 psi) / 0...100 bar (0...1450 psi)
 Enclosure material Al Si 9 Cu 3
 Protection rating IP65
 Electrical connection 7-pole industrial plug DIN VDE 0627 / IEC 61984
 wire cross-section 0.25 - 1 mm²
 cable outlet PG 11

Sensor protection Stainless steel sintered filter
 Working temperature range medium (air): -40...70 °C (-40...158 °F)
 electronics: -40...60 °C (-40...140 °F)
 display: -20...50 °C (-4...122 °F)

Storage temperature range -40...60 °C (-40...140 °F)

Electromagnetic compatibility EN 61326-1 EN 61326-2-3
 Industrial Environment
 FCC Part15 ClassB ICES-003 ClassB



1) Traceable to international standards, administrated by NIST, PTB, BEV...

The accuracy statement includes the uncertainty of the factory calibration with an enhancement factor k=2 (2-times standard deviation). The accuracy was calculated in accordance with EA-4/02 and with regard to GUM (Guide to the Expression of Uncertainty in Measurement).

2) Class 2 in USA & Canada



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